KENDRIYA VIDYALAYA GACHIBOWLI, GPRA CAMPUS HYD – 32

REVISION TEST - 06 FOR CLASS X BOARD EXAM 2021

SAMPLE ANSWERS

Max. marks: 80 **Time Allowed: 3 hrs**

General Instruction:

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

Part – A:

1. It consists three sections- I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 4 questions on case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B:

1. Question No 21 to 26 are Very short answer Type questions of 2 mark each,
2. Question No 27 to 33 are Short Answer Type questions of 3 marks each
3. Question No 34 to 36 are Long Answer Type questions of 5 marks each.

PART - A

SECTION-I

Questions 1 to 16 carry 1 mark each.

1. If HCF (336, 54) = 6, find LCM (336, 54).

$$\text{LCM } (336, 54) = \frac{336 \times 54}{6} = 336 \times 9 = 3024$$

2. Find the nature of roots of the quadratic equation $2x^2 - 4x + 3 = 0$.

$2x^2 - 4x + 3 = 0 \Rightarrow D = 16 - 24 = -8$

$\therefore$ Equation has NO real roots

3. Find the common difference of the Arithmetic Progression (A.P.) $\frac{1}{a}, \frac{3-a}{3a}, \frac{3-2a}{3a}, ...(a \neq 0)$

$$\frac{3-a}{3a} - \frac{1}{a} = \frac{3-a-3}{3a} = -\frac{1}{3}$$

4. Evaluate: $\sin^2 60^0 + 2 \tan 45^0 - \cos^2 30^0$.

$$\sin^2 60° + 2 \tan 45° - \cos^2 30 = \left(\frac{\sqrt{3}}{2}\right)^2 + 2(1) - \left(\frac{\sqrt{3}}{2}\right)^2 = 2$$

5. If sin A = 3/4, calculate sec A.

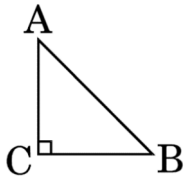
$$\sin A = \frac{3}{4} \Rightarrow \cos A = \sqrt{1 - \frac{9}{16}} = \frac{\sqrt{7}}{4}$$

$$\sec A = \frac{4}{\sqrt{7}}$$

6. Write the coordinates of a point P on x-axis which is equidistant from the points A(– 2, 0) and B(6, 0).

Point on x-axis is (2, 0)

7. In the below figure, ABC is an isosceles triangle right angled at C with AC = 4 cm. Find the length of AB.



ΔABC: Isosceles $\Delta \Rightarrow AC = BC = 4$ cm.

$AB = \sqrt{4^2+4^2} = 4\sqrt{2}$ cm

8. For what values of k does the quadratic equation $4x^2 - 12x - k = 0$ have no real roots?

Disc. $= 144 - 4 \times 4 \times (-k) < 0$

$16k < -144$

$k < -9$

9. Find the value(s) of k so that the pair of equations $x + 2y = 5$ and $3x + ky + 15 = 0$ has a unique solution.

For unique solution $\frac{1}{3} \neq \frac{2}{k} \Rightarrow \quad k \neq 6$

10. If $\cot A + \frac{1}{\cot A} = 2$, then prove that $\cot^2 A + \frac{1}{\cot^2 A} = 2$.

Squaring both sides, we get

$$\cot^2 A + \frac{1}{\cot^2 A} + 2 = 4$$

$$\cot^2 A + \frac{1}{\cot^2 A} = 2$$

11. If 3 chairs and 1 table costs Rs. 1500 and 6 chairs and 1 table costs Rs.2400. Form linear equations to represent this situation.

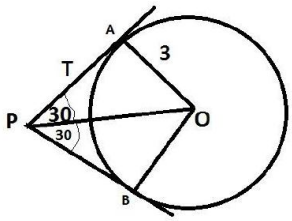
Let the cost of 1 chair be Rs.x and the cost of 1 table be Rs. y

$3x + y = 1500$ and $6x + y = 2400$

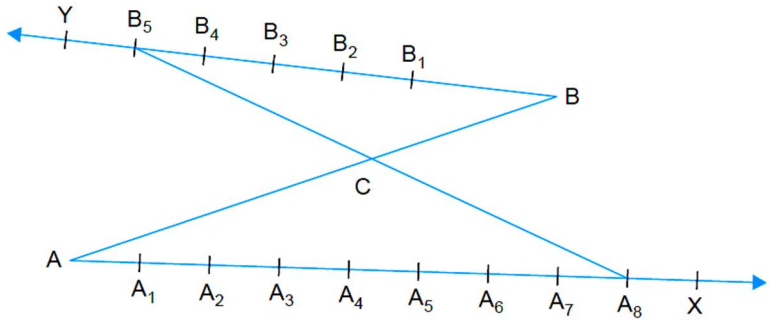
12. If two tangents are inclined at 60˚ are drawn to a circle of radius 3cm then find length of each tangent.

$In \Delta PAO, \tan 30^0 = \frac{AO}{PA}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{3}{PA} \Rightarrow PA = 3\sqrt{3} cm$



13. In the figure, if B_1, B_2, B_3,..... and A_1,A_2, A_3,..... have been marked at equal distances. In what ratio C divides AB?

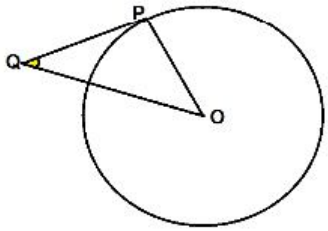


Answer- 8 : 5

14. In a circle of diameter 42cm, if an arc subtends an angle of 60˚ at the centre where $\pi = 22/7$, then what will be the length of arc.

$Length \ of \ arc = \frac{\theta}{360} \times 2\pi r = \frac{60}{360} \times 2 \times \frac{22}{7} \times 21 = 22 cm$

15. PQ is a tangent to a circle with centre O at point P. If ΔOPQ is an isosceles triangle, then find ∠OQP.



$In\ \ \Delta OPQ, \angle P + \angle Q + \angle O = 180^0$

$\Rightarrow 2\angle Q + \angle P = 180^0 \Rightarrow 2\angle Q + 90^0 = 180^0$

$\Rightarrow 2\angle Q = 90^0 \Rightarrow \angle Q = 45^0$

16. 12 solid spheres of the same radii are made by melting a solid metallic cylinder of base diameter 2cm and height 16cm. Find the diameter of each sphere.

$\pi R^2 H = 12 \times \frac{4}{3}\pi r^3 \Rightarrow 1 \times 1 \times 16 = 12 \times \frac{4}{3} r^3$

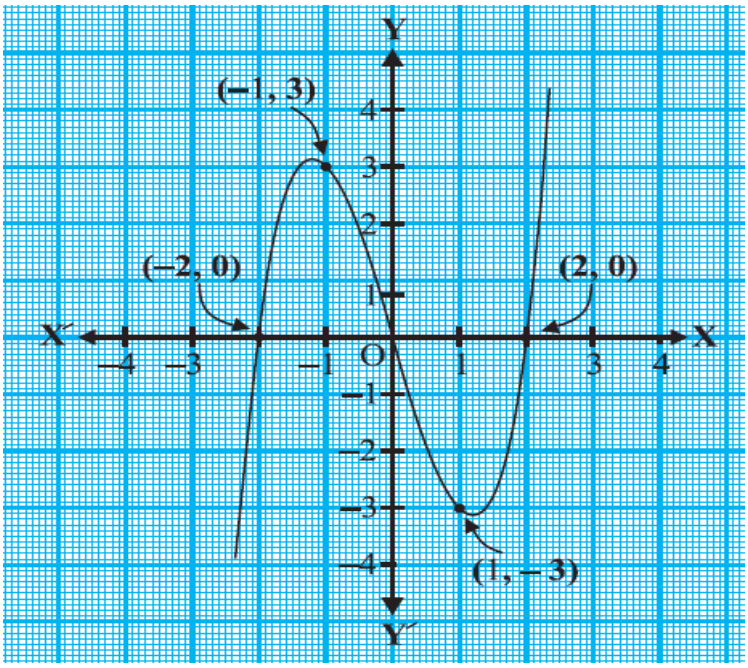
$\Rightarrow r^3 = 1 \Rightarrow r = 1 \Rightarrow d = 2cm$

SECTION-II

Case study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

17. Case Study based-1: Heavy Storm

One day, due to heavy storm an electric wire got bent as shown in the figure. It followed some mathematical shape of curve. Answer the following questions below.



(a) How many zeroes are there for the polynomial (shape of the wire)

(i) 2 (ii) 3 (iii) 4 (iv) 5

Answer: (ii) 3

(b) Find the zeroes of the polynomial.

(i) 2, 0, -2 (ii) 2, 0 (iii) -2, 2 (iv) None of these

Answer: (i) 2, 0, -2

(c) What will be the expression of the polynomial?

(i) $x^3 + 4x^2 + 2x$ (ii) $x^3 - 4x^2$

(iii) $x^3 - 4x$ (iv) None of these

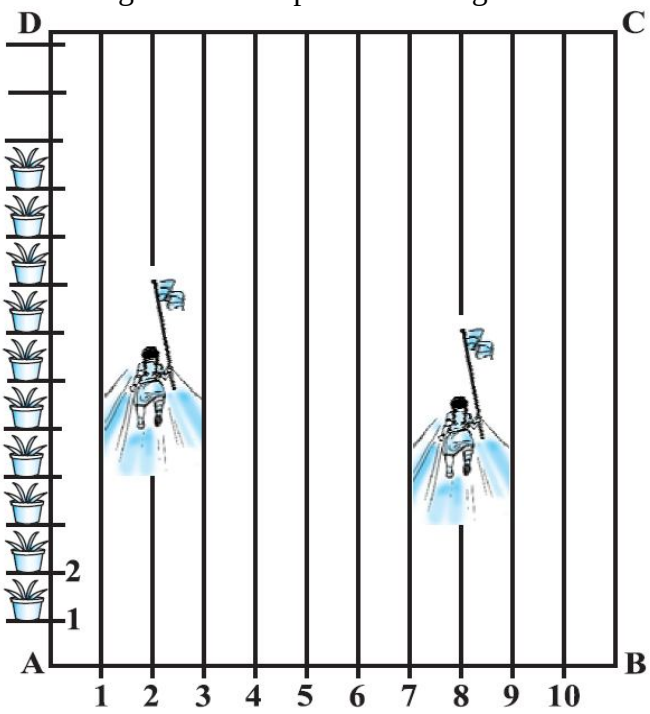
Answer: (iii) $x^3 - 4x$

(d) Name the type of expression of the polynomial?
(i) quadratic (ii) cubic (iii) linear (iv) bi-quadratic
Answer: (i) quadratic

(e) What is the value of the polynomial if x =-2?
(i) 2 (ii) 3 (iii) 4 (iv) 0
Answer: (iv) 0

18. Case Study based-2: Sports Day activities

To conduct Sports Day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1m each. 100 flower pots have been placed at a distance of 1m from each other along AD, as shown in the below figure. Niharika runs 1/4 th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5 th the distance AD on the eighth line and posts a red flag.



(a) At what distance Niharika posted the green flag from the starting point of second line?
(i) 20 m (ii) 25 m (iii) 100 m (iv) 50 m
Answer: (ii) 25 m

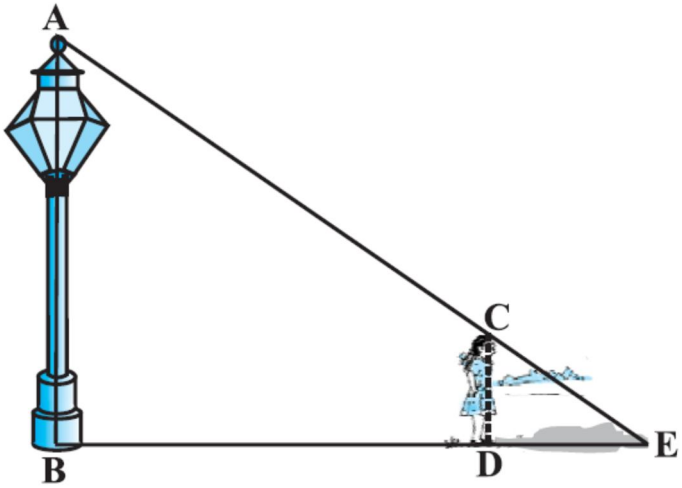
(b) At what distance Preet posted the green flag from the starting point of eighth line?
(i) 20 m (ii) 25 rn (iii) 100 m (iv) 50 m
Answer: (i) 20 m

(c) What is the distance between both the flags?
(i) √61 m (ii) √101 m (iii) √51 m (iv) √11 m
Answer: (i) √61 m

(d) If Rashmi has to post a blue flag exactly halfway between the line segments joining the two flags, where should she post her flag?
(i) (5, 5) (ii) (22.5, 5) (iii) (5, 22.5) (iv) none of these
Answer: (iii) (5, 22.5)

(e) If Shweta has to post a white flag exactly halfway between the line segments joining A and red flag, where should she post her flag?
(i) (4, 5) (ii) (12.5, 4) (iii) (4, 22.5) (iv) (4, 12.5)
Answer: (iv) (4, 12.5)

19. On one day, a poor girl of height 90 cm is looking for a lamp-post for completing her homework as in her area power is not there and she finds the same at some distance away from her home. After completing the homework, she is walking away from the base of a lamp-post at a speed of 1.2 m/s. The lamp is 3.6 m above the ground (see below figure).



(a) Find her distance from the base of the lamp post.
(i) 2 m (ii) 1.2 m (iii) 4.8 m (iv) 5 m
Answer: (iii) 4.8 m

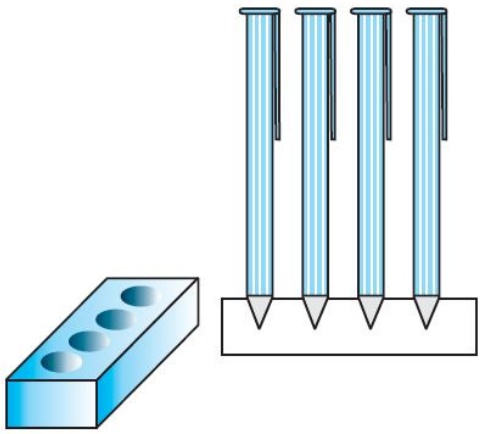
(b) Find the correct similarity criteria applicable for triangles ABE and CDE.
(i) AA Similarity (ii) SAS Similarity (iii) SSS Similarity (iv) None of these.
Answer: (i) AA Similarity

(c) Find the length of her shadow after 4 seconds.
(i) 2 m (ii) 1.2 m (iii) 4.8 m (iv) 1.6 m
Answer: (iv) 1.6 m

(4) Sides of two similar triangles are in the ratio 9:16. Find the ratio of Corresponding medians of these triangles.
(i) 81 : 256 (ii) 9 : 16 (iii) 3 : 4 (iv) None of these
Answer: (ii) 9 : 16

(e) Find the ratio AE:CE.
(i) 3 : 4 (ii) 4 : 1 (iii) 3 : 1 (iv) None of these
Answer: (ii) 4 : 1

20. A student made a wooden pen stand which is in the shape of a cuboid with four conical depressions to hold pens. The dimensions of the cuboid are 15 cm by 10 cm by 3.5 cm. The radius of each of the depressions is 0.5 cm and the depth is 1.4 cm. Find the volume of wood in the entire stand (see the below figure).



(a) What is the volume of cuboid?
(i) 525 cm^3 (ii) 225 cm^3 (iii) 552 cm^3 (iv) 255 cm^3.
Answer: (i) 525 cm^3

(b) What is the volume of cone?

(i) $\frac{11}{3}$ cm^3 (ii) $\frac{11}{30}$cm^3 (iii) $\frac{3}{11}$cm^3 (iv) $\frac{30}{11}$cm^3.

Answer: (ii) $\frac{11}{30}$cm^3

(c) What is the total volume of conical depressions?

(i) 1.74 cm^3 (ii) 1.44 cm^3 (iii) 1.47 cm^3 (iv) 1.77 cm^3

Answer: (iii) 1.47 cm^3

(d) What is the volume of wood in the entire stand?

(i) 522.35 cm^3 (ii) 532.53 cm^3 (iii) 523.35 cm^3 (iv) 523.53 cm^3

Answer: (iv) 523.53 cm^3

(e) The given problem is based on which mathematical concept?

(i) Triangle (ii) Surface Areas & Volumes (iii) Height & Distances (iv) None of these

Answer: (ii) Surface Areas & Volumes

PART – B

(Question No 21 to 26 are Very short answer Type questions of 2 mark each)

21. Prove that $2 + 5\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

Let $2+5\sqrt{3} = a$, where 'a' is a rational number.

then $\sqrt{3} = \frac{a-2}{5}$

Which is a contradiction as LHS is irrational and RHS is rational

$\therefore$ $2+5\sqrt{3}$ can not be rational

Hence $2+5\sqrt{3}$ is irrational.

22. Find the quadratic polynomial, sum and product of whose zeroes are –1 and – 20 respectively. Also find the zeroes of the polynomial so obtained.

If α, β are zeroes of the polynomial, then

$\alpha + \beta = -1$, $\alpha\beta = -20$

$\therefore$ Polynomial is $(x^2 + x - 20)$

$= (x + 5)(x - 4)$

$\therefore$ Zeroes of the polynomial are 4 and –5

23. Draw two concentric circles of radii 2 cm and 5 cm. Take a point P on the outer circle and construct a pair of tangents PA and PB to the smaller circle.

Constructing two concentric circle of radii 2 cm and 5 cm 1 mark

Drawing two tangents PA and PB 1 mark

24. Points A(3, 1), B(5, 1) C(a, b) and D(4, 3) are vertices of a parallelogram ABCD. Find the values of a and b.

Points A (3, 1), B(5, 1), C(a, b) and D(4, 3) are vertices of parallelogram
We know that diagonals of parallelogram bisect each other
The M be the midpoint of both AC and BD
So by midpoint formula

$\therefore M = \left(\frac{3+a}{2} + \frac{1+b}{2}\right)$

also,

$M = \left(\frac{5+4}{2} + \frac{1+3}{2}\right) = \left(\frac{9}{2}, 2\right)$

so,

$\therefore \left(\frac{3+a}{2} + \frac{1+b}{2}\right) = \left(\frac{9}{2}, 2\right)$

$\therefore \frac{3+a}{2} = \frac{9}{2}$

$\therefore a = 6$

$\therefore \frac{1+b}{2} = 2$

$b = 3$

25. A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC

Since the lengths of tangents drawn from an external point are equal,

$\therefore$ BQ = BP ...(1)

Similarly, AS = AP ...(2)

CQ = CR ...(3)

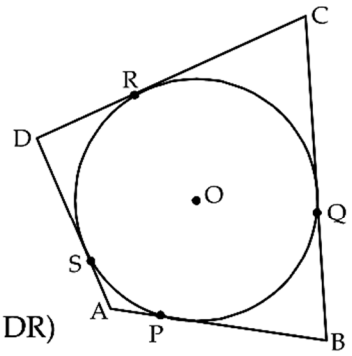
and DS = DR ...(4)

Adding (1), (2), (3) and (4), we get:

(BQ + CQ) + (AS + DS) = (BP + AP) + (CR + DR)

$\Rightarrow$ BC + AD = AB + CD.

Hence, AB + CD = AD + BC.



26. The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower, is 30°. Find the height of the tower.

Let BC (= h m) be the height of tower and AB (= 30 m) be the distance on the ground level.

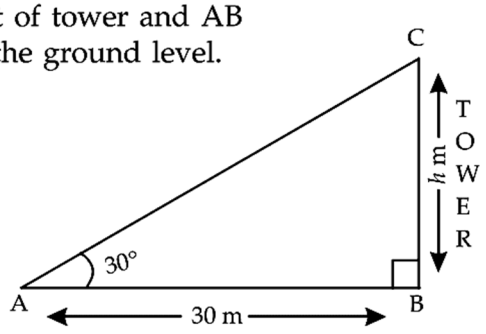
Also, $\angle BAC = 30°$.

In right ΔABC,

$$\frac{BC}{AB} = \tan 30°$$

$$\Rightarrow \frac{h}{30} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow h = \frac{30}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{30}{3}\sqrt{3} = 10\sqrt{3} \text{ m}$$



(QUESTION NO 27 TO 33 ARE SHORT ANSWER TYPE QUESTIONS OF 3 MARKS EACH)

27. In a morning walk, Nawal, Sanjay and Rajiv step off together, their steps measuring 240 cm, 90 cm, 120 cm respectively. What is the minimum distance each should walk do that one can cover the distance in complete steps?

$240 = 2^4 \times 3 \times 5$ $\quad 90 = 2 \times 3^2 \times 5$ $\quad 120 = 2^3 \times 3 \times 5$

$\therefore$ Required distance = LCM (240, 90, 120)

$= 2^4 \times 3^2 \times 5 = 720.$

28. Prove that: $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}=1+\sec\theta\cos ec\theta$

$$\text{LHS} = \frac{\tan\theta}{1-\frac{1}{\tan\theta}}+\frac{\frac{1}{\tan\theta}}{1-\tan\theta}=\frac{\tan^2\theta}{\tan\theta-1}-\frac{1}{\tan\theta(\tan\theta-1)}$$

$$= \frac{\tan^3\theta-1}{\tan\theta(\tan\theta-1)}=\frac{(\tan\theta-1)(\tan^2\theta+\tan\theta+1)}{\tan\theta(\tan\theta-1)}$$

$$=\tan\theta+1+\cot\theta=1+\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\sin\theta}=1+\frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}$$

$$= 1+\frac{1}{\sin\theta\cos\theta}=1+\cos ec\,\theta\sec\theta=\text{RHS}$$

29. How many terms of the Arithmetic Progression 45, 39, 33, ... must be taken so that their sum is 180 ? Explain the double answer.

$S_n = 180=\frac{n}{2}\cdot[90+(n-1)(-6)]$

$360 = 90n - 6n^2 + 6n \Rightarrow 6n^2 - 96n + 360 = 0$

$\Rightarrow \quad 6[(n-6)(n-10)] = 0 \Rightarrow n = 6,\ n = 10$

Sum of $a_7, a_8, a_9, a_{10} = 0 \ \therefore\ n = 6$ or $n = 10$

30. Which term of the Arithmetic Progression –7, –12, –17, –22, ... will be –82 ? Is –100 any term of the A.P. ? Give reason for your answer.

Let $-82 = a_n \ \therefore\ -82 = -7 + (n-1)(-5)$

$\Rightarrow \quad 15 = n - 1$ or $n = 16$

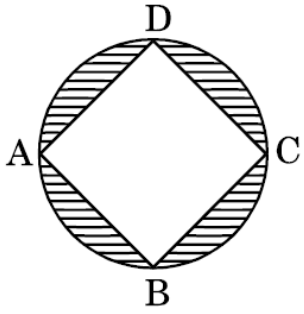
Again $-100 = a_m = -7 + (m-1)(-5)$

$\Rightarrow \quad (m-1)(-5) = -93$

$$m - 1 = \frac{93}{5} \text{ or } m=\frac{93}{5}+1\notin N$$

$\therefore \quad -100$ is not a term of the AP.

31. In the below Figure, ABCD is a square with side $2\sqrt{2}$ cm and inscribed in a circle. Find the area of the shaded region. (Use $\pi = 3{\cdot}14$)



b

$\text{BD}=\sqrt{(2\sqrt{2})^2+(2\sqrt{2})^2}=\sqrt{16}=4\text{ cm}$

$\therefore$ Radius of circle = 2 cm

$\therefore$ Shaded area = Area of circle – Area of square

$= 3.14\times 2^2-(2\sqrt{2})^2$

$= 12.56 - 8 = 4.56\ \text{cm}^2$

32. A plane left 30 minutes later than the scheduled time and in order to reach its destination 1500 km away on time, it has to increase its speed by 250 km/hr from its usual speed. Find the usual speed of the plane.

Let x km/hr be the usual speed of the plane

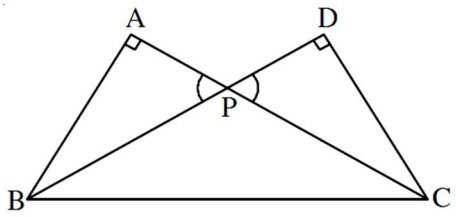
$$\therefore \quad \frac{1500}{x} - \frac{1500}{x+250} = \frac{1}{2}$$

$$\Rightarrow \quad x^2 + 250x - 750000 = 0$$

$$\Rightarrow \quad x = -1000 \text{ or } 750$$

$\therefore$ Speed of the plane = 750 km/h

33. Two right triangles ABC and DBC are drawn on the same hypotenuse BC and on the same side of BC. If AC and BD intersect at P, prove that AP x PC = BP x DP.



$\Delta APB \sim \Delta DPC$ [AA similarity]

$$\frac{AP}{DP} = \frac{BP}{PC}$$

$$\Rightarrow \quad AP \times PC = BP \times DP$$

(QUESTION NO 34 TO 36 ARE LONG ANSWER TYPE QUESTIONS OF 5 MARKS EACH.)

34. A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10 km/h; it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.

Let the actual speed of the train
$= x$ km/hr
and the actual time taken = y hrs

Case I: When the speed of the train
$= (x + 10)$ km/hr

then $(x + 10)(y - 2) = xy$

$\Rightarrow \quad xy + 10y - 2x - 20 = xy$

$\Rightarrow \quad -x + 5y = 10 \quad ...(1)$

Case II: When the speed of the train
$= (x - 10)$ km/hr

then, $(x - 10)(y + 3) = xy$

$\Rightarrow \quad xy - 10y + 3x - 30 = xy$

$\Rightarrow \quad 3x - 10y = 30 \quad ...(2)$

Solving equations (1) and (2), we have

$3 \times (-x + 5y) = 3 \times 10$

$-3x + 15y = 30$

$3x - 10y = 30$

$5y = 60$

$\Rightarrow \quad y = 12$

Substituting the value of $y = 12$ in equation (1), we have

$-x + 5 \times 12 = 10$

$-x + 60 = 10$

$-x = -50 \quad \Rightarrow \quad x = 50$

Hence, actual speed of train
$= 50$ km/hr
and the distance covered by the train
= speed × time
$= 50 \times 12 = 600$ km.

35. Amit, standing on a horizontal plane, finds a bird flying at a distance of 200 m from him at an elevation of 30^0. Deepak standing on the roof of a 50 m high building, finds the angle of elevation of the same bird to be 45^0. Amit and Deepak are on opposite sides of the bird. Find the distance of the bird from Deepak.

In ΔAPQ

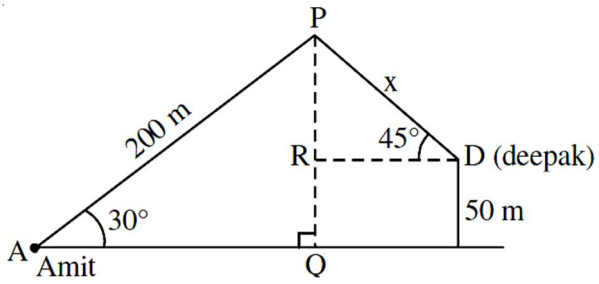
$$\frac{PQ}{AP} = \sin 30° = \frac{1}{2}$$

$$PQ = (200)\left(\frac{1}{2}\right) = 100 \text{ m}$$

$$PR = 100 - 50 = 50 \text{ m}$$

$$\text{In } \Delta PRD, \frac{PR}{PD} = \sin 45° = \frac{1}{\sqrt{2}}$$

$$PD = (PR)(\sqrt{2}) = 50\sqrt{2} \text{ m}$$



36. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 gm mass. (Use $\pi = 3{\cdot}14$)

Total volume = $3.14\ (12)^2\ (220) + 3.14(8)^2(60)\ cm^3$

$= 99475.2 + 12057.6 = 111532.8\ cm^3$

$$\text{Mass} = \frac{111532.8 \times 8}{1000} \text{ kg}$$

$= 892.262$ kg